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THE JOURNAL OF THE BRITISH VETERINARY ASSOCIATION

The Veterinary Record

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Vol. 73 No. 31 Issue No. 4341 751-772

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THE VETERINARY RECORD

Founded by William Hunting, F.R.C.V.S., in 1888

Volume 73
No. 31

SATURDAY, AUGUST 5th, 1961

7 Mansfield Street,
London, W.1.
Museum 6541

Hypomagnesaemia Conference

During two full days in November last, a large gathering of workers in the veterinary and cognate fields listened to and then discussed the views of various speakers concerning that disease, or group of diseases, which so frequently affects cattle and sheep and which is seldom given any more specific name than "hypomagnesaemia."

It thus behoves us to consider what should be the true function of a Conference such as this, the proceedings of which are described in the following pages? To enable those who are seldom slow at coming forward to bask yet again in the bright lights? Or to give to the shyly diffident some quiet corner of the conference hall, where they may listen silently before going away again, primed with new thoughts for the next year or two? Is it to enable X, who was an active worker in this field—but several years ago!—to put an improved gloss on old studies, or to allow young Y, who qualified a couple of years ago but has managed to publish three papers and address several meetings, to progress farther towards his prospective "chair" or other ambitious goal? Should it serve to put Z, now with a commercial organisation, into a cold sweat because he has omitted to make a take-over bid for the Dolomites, which may thus fall into the hands of his closest rivals?

If it is unfair to spot-light individual foibles of this kind, however potent they may be eventually in getting things done and however guilty each of us may be, in his own particular fashion, perhaps it will be more profitable of discussion to look at things from the more purely functional—and, of course, *entirely* dispassionate—point of view. It may, indeed, be more profitable, just as it is far more likely to lead to a severe headache. To listen to A, who is a nutritionist, "hypomagnesaemia" is very much a matter of what goes into the beast—or should one say, what fails to go into it, whereas B gives not a hoot for what enters the animal. Being a renal physiologist, B knows beyond dispute that what counts is what comes out of the beast. Surely anyone can see that? Not C, however, who thinks that both of these fellows are too highly academic to have their feet firmly on the ground and that neither of them could recognise a case of "hypomagnesaemia" without making a serum magnesium determination! Whereupon D says nothing, but goes home to tell his wife that none of these people has the faintest notions of animal husbandry or of the importance of climatic stress.

On second thoughts maybe none of us is quite as crabbed as this: we can all see the other man's point of view—though to be quite frank it seems very little to serve as the cause for so much song! Nevertheless, all of these aspects of the hypomagnesaemia problem received their due attention at the Conference. But should we leave the matter there? Is it enough to meet merely to propose so many different ideas and then to go away again? Surely not. If the problem had been more simple there would have been no need to confer. Now, however, that its complications are there to be acknowledged, something more seems to be required. It is a matter of common observation these days, that the research group, each member of which has some special skill, is tending to supplant the old individual investigator, although the latter will always find a useful place in some field or other. There would seem to be a corresponding benefit to be derived from the getting together of the various "teams" to plan further work on the problem. But who is to undertake the task of getting the interested individuals together? Is it too much to ask those who organised the Conference, the need for which they saw clearly enough, to make the attempt? It is surely within the bounds of possibility that the various individuals and research teams could take part in a large scheme without sacrifice of their own autonomy. Progress can be made, of course, even in the absence of such higher co-ordination, but it is likely to be much slower. Whatever the outcome at least let us plan an attack on this difficult problem.

The Isolation and Characterisation of Some Enteroviruses from Pigs

BY

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SUMMARY.—It is suggested that the following 4 criteria should be fulfilled before a virus is termed a porcine enterovirus. These are that the virus should be:

1. *Small, i.e. of the order of 30 to 40 mμ in size.*
2. *Resistant to ether.*
3. *Capable of multiplying in the alimentary tract of the pig.*
4. *Cytopathogenic for porcine kidney tissue cultures.*

The isolation of a number of cytopathogenic agents from the faeces of pigs is recorded. Some of these agents, together with the viruses of Teschen and Talfan diseases and the T80, T52A, F52 and V13 viruses were shown to satisfy the criteria and were divided into at least 9 distinguishable groups by means of cross-neutralisation tests in tissue cultures.

Introduction

DURING the last decade it has been shown by the use of tissue culture techniques that a large number of viruses with common properties inhabit the alimentary tract of man. These viruses are all small, they are resistant to ether and they are excreted in the faeces. Most of them are cytopathogenic for monkey kidney tissue cultures. The name "enteroviruses" has been adopted for this group of viruses which includes the polioviruses, the Coxsackie viruses and the ECHO (enteric cytopathogenic human orphan) viruses (Committee on Enteroviruses, 1957).

There have already been several reports of the isolation from pigs of viruses with some properties comparable with those of human enteroviruses. (Moscovici, Ginevri & Mazzaracchio, 1959; Lamont & Betts, 1958, 1960; Beran, Werder & Wenner, 1958; Hancock, Bohl & Birkeland, 1959; Webster, 1959; Betts, 1960a.). The terms "enteroviruses" and "orphan" viruses have been applied to these agents sometimes somewhat arbitrarily.

The purposes of this brief article are to put forward for consideration criteria which, in our opinion, should be fulfilled before a virus isolated from pigs is termed an enterovirus, and to record the isolation from pigs in this country of a number of viruses which fufil these criteria.

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Suggested Criteria for the Characterisation of Enteroviruses from Pigs

We suggest the following 4 criteria:

1. The virus should be small, *i.e.* of the order of 30 to 40 mμ in size.
2. It should be resistant to ether when exposed to a concentration of 20 per cent. for 18 hours at 4°C.
3. It should inhabit the alimentary tract of the pig and be recoverable from the faeces for a sufficiently long period of time to provide evidence of multiplication.
4. The virus should produce cytopathic changes in porcine kidney tissue cultures.

Materials and Methods

Viruses

A sample of faeces was collected from each of 69 bacon pigs killed at a local bacon factory in June 1958. These pigs came from 8 different farms in East Anglia. Viruses were isolated from these samples by techniques similar to those described elsewhere (Lamont & Betts, 1960; Betts & Jennings, 1960).

Other viruses included in the study were the viruses of Teschen and Talfan diseases, the T80 and T52A strains of a swine polio-encephalomyelitis virus (Betts, 1960 a, c) and the V13 virus (Lamont & Betts, 1960). The T80 and T52A viruses had been recovered from the tonsils of 2 bacon pigs and the V13 virus had been recovered from the faeces of a pig from a commercial herd. The virus of Teschen disease was kindly provided by Dr. A. Mayr (Tubingen, Germany) and the virus of Talfan disease by Mr. R. A. Huck (Weybridge).

Tissue Culture Techniques

The techniques for the preparation of porcine kidney monolayer cultures and the use of such cultures for the study of some porcine viruses have been described elsewhere (Betts, 1960a, b; Jennings & Kelly, 1960). These kidneys came from young pigs obtained from the herd of the School of Veterinary Medicine. In later experiments kidneys were obtained from "pathogen-free," colostrum-deprived piglets produced and reared by the methods described by Betts, Lamont and Littlewort (1960).

In all the experiments described in this paper viruses were used in the form of infective tissue culture fluids which had been centrifuged at approximately 2,000 G for 10 minutes to deposit cell debris.

Infection of Experimental Pigs

All the pigs used in these experiments were young "pathogen-free," colostrum-deprived pigs. Experimental pigs were inoculated by the oral and intranasal routes with the virus under examination and in all 20 isolates were examined in this way. Samples of faeces were collected before and at intervals after infection and were examined for the presence of virus.

Preparation of Antisera

Antisera were prepared in "pathogen-free," colostrum-deprived pigs or in rabbits. Pigs were infected orally and intranasally; rabbits were inoculated subcutaneously and thereafter intravenously with virus which had been passaged through porcine kidney tissue cultures between 10 and 24 times.

Grouping of Viruses

The viruses were grouped by means of cross-neutralisation tests similar to those recommended by the Committee on Enteroviruses (1957) for the serological grouping of human enteroviruses. The tests involved the titration of antisera against 100 TCID50 of each virus. Details will be reported elsewhere.

Estimation of Size

The sizes of the viruses were estimated by applying the correction factor of 0.64 suggested by Black (1958) to the results obtained by filtering infective tissue culture fluids under negative pressure through gradocol membranes held in stainless-steel filters.

Ether Resistance Tests

Anaesthetic ether B.P. was added to infective tissue culture fluid in a screw-capped bottle to give a final concentration of 20 per cent. The mixture was shaken and stored for 18 hours at 4°C. To evaporate the ether the contents of the bottle were decanted into a Petri dish and incubated at 36°C. for 30 minutes before titration. Control specimens were treated similarly but without ether.

Results

Cytopathogenic viruses were isolated from the faeces of 19 of the 69 pigs. These viruses were referred to by the serial number allotted to each pig and their source was indicated by the prefix F. Including the viruses T80, T52A and V13, and the viruses of Teschen and Talfan diseases there were thus 24 agents available for study.

Grouping of Viruses

The 24 agents have been divided into at least 9 serologically distinguishable groups. The ninth contains those isolates for which antisera are not yet available and it may well consist of several serologically distinguishable agents. The groups have been numbered I to IX for the purposes of this article only; it is not intended that these designations should have any other taxonomic significance. The exact relationships of the viruses within the groups is still under investigation.

TABLE I

SOME PROPERTIES OF A NUMBER OF CYTOPATHOGENIC AGENTS ISOLATED FROM PIGS

Serological group	Agents included in the group	Size estimated (milli microns)	Effect of 20 per cent. ether for 18 hours at 4° C.	
			Titre of* control aliquot	Titre* after treatment
I	Teschen virus	30[1]	6·3	6·3
	Talfan virus	25–30[2]	5·5	5·9
II	T80	30	5·3	5·5
	T52A	30	6·1	6·1
	F52	30[3]	3·2	3·3
III	F7	35	5·2	5·3
IV	V13	35–40	4·2	4·5
	(F41)	N.E.	2·2	2·1
V	F12	35	3·9	3·7
VI	F34	35	4·3	4·5
	(F45), (F53)	N.E.	N.E.	N.E.
VII	F70	35	5·0	5·2
	(F39), (F65)	N.E.	N.E.	N.E.
VIII	F76	35	⩾4·2	4·5
	(F78)	N.E.	N.E.	N.E.
IX	F17	36	2·9	3·0
	F26	36	3·5	3·2
	F32	36	4·5	4·5
	F35	31	3·2	2·9
	F38	36	4·3	4·4
	F43	44	3·4	3·5
	F59	<38	3·9	4·2

N.E. = Not examined.

* Titre expressed in $\log_{10}$ TCID50 per 1·0 ml. (50 per cent. tissue culture infective doses).

[1] Greig (1961).

[2] Bradish, Huck and Kirkham (1961)

[3] Johnson (1958).

The agents shown in parentheses have not been fully examined and, although they are serologically related to the other members of the group, it cannot be assumed that they are enteroviruses.

Size

The estimated sizes of the viruses examined are shown in Table I. It can be seen that these sizes were within the range 30 to 45 mμ; in fact, only one (F43) exceeded 40 mμ. Where the results of other workers are included this is acknowledged in the references.

Resistance to Ether

The results are summarised in Table I. In no instance was there any significant reduction in infectivity following treatment with ether for 18 hours at 4°C.

Recovery from the Alimentary Tracts of Pigs

The 20 viruses examined have been recovered from the faeces of the experimentally infected pigs at least 9 days after infection by the oral and intranasal routes. In several instances it has been shown that viruses could be recovered for much longer periods. For example T80 virus was

isolated from the faeces of pigs 52 days after infection (Betts & Jennings, 1960) the V13 virus 31 days (Lamont & Betts, 1960) the T52A virus 24 days (Betts & Jennings, 1960) and the viruses of Teschen and Talfan diseases 21 days after infection.

Cytopathic Effects

All these agents produced definite cytopathic changes in stationary porcine kidney monolayer cultures. The changes caused by T80 have been described elsewhere (Jennings & Kelly, 1960) and appeared typical of the majority of these viruses. These changes comprised rounding and clumping of cells leading to dissolution of the cell sheet. However, the cytopathic effects of V13 and F41, which were similar to each other, were slightly different. This type of change has been described for V13 by Lamont and Betts (1960).

Discussion

The establishment of criteria for the family of human enteroviruses (Committee on Enteroviruses, 1957) has proved of value in the classification of many of the recently isolated viruses of man and it appears useful to adopt similar criteria for enteroviruses isolated from other species. Accordingly four criteria have been suggested which we feel should be fulfilled before any virus isolated from a pig is designated a porcine enterovirus. These criteria have been fulfilled by most of the agents included in this study. But 6 agents (F39, F41, F45, F53, F65 and F78) which were grouped serologically have not been examined fully and so should not yet be described as porcine enteroviruses.

It should be emphasised that the suggested criteria are purely tentative and are only intended to provide a working classification which may be useful in the light of present knowledge. They may well require amendment in the future. For example, there may occur in pigs viruses comparable with the Coxsackie viruses of man. Not all Coxsackie viruses are cytopathogenic for monkey kidney tissue cultures but they have other properties making desirable their inclusion within the family of human enteroviruses. Cooper (1961) has proposed a system of virus classification in which emphasis is placed on the nature of the nucleic acid present in the virus. The human enteroviruses contain ribonucleic acid (RNA) and this property is used as a primary criterion in their classification. Teschen and Talfan viruses are known to contain RNA (Brown & Stewart, 1960) but we have no information about the nature of the nucleic acid in the other enteroviruses referred to in this paper.

The qualification " porcine " is used in this paper to describe enteroviruses that can infect the pig. It is not suggested that these viruses cannot infect other species, nor that enteroviruses of other species cannot infect the pig. We feel that it is not desirable to classify viruses primarily on a host species basis but it is convenient to describe the enteroviruses by reference to their host until some broader biological classification is accepted. Thus, the term " porcine enterovirus " does not necessarily have any connotations of specificity for pigs or porcine tissue cultures.

Considerable attention is paid to the epidemiology of enterovirus infections in man. At present there is little information concerning the epidemiology of natural enterovirus infections of pigs but it is likely that, as a result of the methods by which pigs are managed on a herd basis, marked differences in epidemiology will be found to exist between the enteroviruses of man and pigs.

According to the criteria suggested in this paper the porcine enteroviruses include both pathogenic viruses and viruses whose pathogenicity has not yet been determined. The viruses of Teschen and Talfan diseases and the T80 and T52A agents are known to cause polio-encephalomyelitis in the pig. At present we have no evidence to associate the other cytopathogenic agents isolated from bacon pigs with clinical disease. It seems unlikely that adequate circumstantial evidence would be forthcoming from a study of natural infections to determine the pathogenicity of these or other similar porcine enteroviruses. Although it is possible to obtain "pathogen-free," colostrum-deprived pigs for experimental infection it may be difficult to combine all the conditions necessary to demonstrate pathogenicity experimentally. Thus, it might be difficult to prove that some of these viruses cause clinical disease; it would be even more difficult to prove conclusively that they were incapable of causing any disease.

The term " orphan " was originally used to describe human enteroviruses which were not known to be associated with any clinical disease. It was intended that this should be regarded as a temporary description until such times as there was evidence to associate any particular serotype with a clinical syndrome. However, in practice the original description is still applied to "orphan " viruses which have been shown to be associated with disease, and the terminology has thus become confusing. By analogy the term " orphan " has been applied to viruses recovered from the faeces of pigs (hence enteric cytopathogenic swine or porcine orphan *i.e.* ECSO or ECPO viruses) but for the reasons given above the term has little to commend it and we prefer to avoid its use.

It is well known that mixtures of serologically distinct enteroviruses can be isolated from one sample of human faeces. This may also occur in pigs. For the definitive serological classification of the porcine enteroviruses specific antisera are essential. These should, therefore, be prepared against viruses which have been " purified " in tissue cultures either by at least 3 passages at terminal dilution or by the plaque technique.

Acknowledgment

Thanks are due to the technicians of the Animal Virus Research Laboratory for their assistance in this work.

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(*Concluded at the foot of col.* 1, *p.* 755)

A New Anthelmintic Thenium (N : N-Dimethyl-N-2-phenoxyethyl-N-2′-thenylammonium) p-chlorobenzene sulphonate : Its Activity Against Hookworms and Roundworms in the Dog

BY

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SUMMARY.—Thenium p-chlorobenzene sulphonate has been shown to be very highly active against Ancylostoma caninum *and* Uncinaria stenocephala *in the dog but less active against* Toxocara canis.

A dose of 200 *to* 250 *mg. base morning and evening was found to be the minimum effective dose for the young puppy and it was not necessary to increase this dose for older, heavier animals.*

No side effects, other than a low incidence of vomition, were observed.

Introduction

THE activity of a new series of anthelmintics against a number of nematodes parasitic in laboratory and domestic animals has been reported (Copp, Standen, Scarnell, Rawes & Burrows, 1958). Several salts of a member of this series, bephenium, have been shown to be highly active against *Nematodirus* spp. and other trichostrongylid nematodes in lambs (Rawes & Scarnell, 1959), against hookworms of the dog (Burrows, 1958; Seneviratna, 1960; Rawes, 1961) and against hookworms of man (Goodwin, Jayawardine & Standen, 1958).

Although no side effects occur in man following the administration of bephenium hydroxynaphthoate, the salt of choice for veterinary purposes, it was found to result in a high incidence of vomition in dogs when given at the minimum effective dose level (Rawes, 1961). Further investigation was therefore conducted to find a compound as active as bephenium but with no side effects. The result of this work was the selection of N : N-Dimethyl-N-2-phenoxyethyl-N-2′-thenylammonium belonging to the series reported by Burrows, Clapham, Copp, Rawes and Standen (1960) in which an N-2′-thenyl group had been substituted for the N-benzyl radical. Very early in this work it was demonstrated that the p-chlorobenzene sulphonate had a number of advantages. Therefore only results with this salt are reported here.

Thiophenium p-chlorobenzene sulphonate is a white solid with a melting point of 159° to 160° C. and a solubility in water of 0.6 per cent. at 20° C. All dose levels were calculated as the amount of base, 173 parts of salt containing 100 parts of base.

This paper records the results obtained when the drug was administered to dogs infected with the hookworms *Ancylostoma caninum* and *Uncinaria stenocephala*, and the roundworm *Toxocara canis*.

Method

All the dogs were kept in kennels under controlled conditions, and their history was known. The hookworm infestations were all induced experimentally, as were some of the roundworm infestations. Most of the puppies also became naturally infested with small numbers of *T. canis*.

The following animals were used in the experiments:—

(a) 79 animals infested with hookworm only.
(b) 29 dogs with mixed hookworm and roundworm infestations and
(c) 14 dogs infested with roundworms only.

Housing and feeding

The bitches which produced the puppies for the experiments whelped in isolated kennels and were hookworm free. The puppies remained in isolation until required, and were then removed to special accommodation which was thoroughly cleaned between each test. They were fed twice daily, the main meal of minced raw meat, cereal and milk with vitamin and mineral supplements being given at 8 a.m. and a light meal of milk and biscuits in the afternoon at 4 p.m.

Experimental infestations

Animals were infested with hookworms as described previously (Rawes, 1961). In order to infect dogs with roundworms, *T. canis* ova were obtained

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The Isolation and Characterisation of some Enteroviruses from Pigs—*Concluded.*

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either from faeces or from female worms, the eggs being collected on a 300 mesh sieve after washing through sieves of a larger mesh to remove debris. The ova were cultured to the infective stage in shallow Petri dishes at room temperature for 14 days and stored in water at 4° C. The infective dose of 1,500 eggs was administered in a gelatine capsule.

The experimental procedure was similar to that reported in the work on bephenium hydroxynaphthoate (Rawes, 1961), all worms passed during the 72 hours after treatment being collected, counted and identified; the number remaining being determined at *post-mortem* examination or by repeating the dosing procedure until a complete clearance had been obtained. All animals were kept under close observation for vomition on the day of treatment and a continuous 8-hour watch was maintained during the palatability and vomition trials.

Administration of drug

Thenium p-chlorobenzene sulphonate was given in gelatine capsules or as compressed products or in the food. First, single doses of the drug were administered, later all doses were divided and given twice on one day, the first dose being administered at 9 a.m., after food had been withheld from the previous evening and the second at 3.30 p.m. The main meal was offered at noon and the light meal of milk and biscuits at 4.30 p.m. When the compound was given in food it was most acceptable in raw minced meat. The first dose was offered in this manner at 9 a.m., if eaten, the main meal was given at noon, any food remaining being removed an hour later. The second dose was given at 3 p.m. in meat as before, together with any treated meat remaining from the morning; the light evening meal was offered an hour later.

Results

The initial test was undertaken to determine whether, as in the case of bephenium hydroxynaphthoate, a dose divided and given twice in one day was more efficient than when the same amount of drug was given at one administration (Rawes, 1961). Thenium p-chlorobenzene sulphonate was administered in gelatine capsules to 9-month-old puppies experimentally infected with *A. caninum*, as a single dose of 100 mg. base per kg. and as 2 doses of 50 mg. base per kg. or of 25 mg. base per kg. given on the same day.

The results are shown in Table I, and once again

TABLE I

AVERAGE PERCENTAGE CLEARANCES OF *A. caninum* FOLLOWING ADMINISTRATION OF SINGLE AND DOUBLE DOSES OF THENIUM P-CHLOROBENZENE SULPHONATE IN GELATINE CAPSULES TO EXPERIMENTALLY INFESTED DOGS

No. of dogs	Dose level	Average total no. of worms	Average per cent. clearance
2	100 mg. base per kg.	18	88
2	50 mg. base per kg. a.m. and p.m.	44	99
2	25 mg. base per kg. a.m. and p.m.	4	100

the divided dose proved more effective so no further testing of single doses was undertaken.

In an attempt to determine whether it is necessary to relate the amount of drug to bodyweight, the next series of experiments was carried out using standard doses of drug ranging from 100 to 400 mg. base, all given both morning and evening. The ages of the dogs varied from 6 weeks to 2½ years, weights from 5 to 45 lb.

The results, recorded in Table II, show 200 mg. base morning and evening to be the minimum dose highly effective against *A. caninum*, there being only a slight increase in activity at the 250 mg. dose level. Efficiency was lower on the whole in the older heavier animals but an increase in the amount of drug administered did not lead to any improvement. However, a larger dose might be necessary for very heavy dogs. The elimination of *T. canis* was variable, it appeared that higher dose levels would be required to give a satisfactory clearance.

When the effective level of thenium p-chlorobenzene sulphonate had been established using the powder in gelatine capsules, two types of compressed product were prepared, one coated with sugar, the other uncoated, and a comparison of their activity was made in 19- to 20-week-old dogs experimentally infected with *A. caninum*. The results are shown in Table III and demonstrate that the efficiency of both products was similar to that of the compound in gelatine capsules.

In Tables IV and V are recorded the results obtained when thenium p-chlorobenzene sulphonate was mixed in the food and offered to dogs infected with *A. caninum* and *T. canis*. The Tables are complementary as the efficiency of the drug is obviously dependent upon the amount of medicated food eaten. It appears that more than 50 per cent. of dogs offered up to 700 mg. base in meat morning and evening, will eat over half of it. With doses of from 250 mg. to 700 mg. base there is little variation in the percentage clearance of *A. caninum*, the average being 76 per cent. The activity of the drug against *T. canis* was again low.

Having established that the minimum effective dose of thenium p-chlorobenzene sulphonate against *A. caninum* was 200 mg. to 250 mg. base morning and evening, these 2 dose levels were examined for activity against *U. stenocephala* in experimentally infected dogs. The results, which are recorded in Table VI, showed the 250 mg. base dose to be more effective than the 200 mg. dose against this parasite.

As 250 mg. base thenium p-chlorobenzene sulphonate given morning and evening had a high level of activity against *A. caninum* and *U. stenocephala* but only a low level against *T. canis*, it was decided to test this compound in combination with piperazine which is known to be highly active against roundworms. The results obtained from these tests demonstrated that the efficiency of the two substances was the same whether given together or alone, a mixture of the two being highly active against both *A. caninum* and *T. canis*. Details of this work will be reported later (Rawes & Clapham, 1961).

TABLE II
MEAN PERCENTAGE CLEARANCES OF *A. caninum* AND *T. canis* FROM DOGS FOLLOWING ADMINISTRATION OF THENIUM P-CHLOROBENZENE SULPHONATE IN GELATINE CAPSULES

Dose level mg. base a.m. and p.m.	No. of dogs	Age (weeks)	Weight (lb.)	*A. caninum*		*T. canis*	
				Mean total worms	Mean per cent. clearance	Mean total worms	Mean per cent. clearance
100	2	6	6	172	93	8·5	100
	2	7	8½	178	84	3·5	45
	1	10	18	Nil		111	28
	2	11	14	158	65	Nil	
	3	17	24	202	98	Nil	
	2	24	28	192	64	Nil	
150	7	6	6½	Nil		9	72
	2	7	8½	149	98	Nil	
	2	16	23	95	70	Nil	
200	5	6	7	Nil		3	100
	2	6	5	54	58*	5·5	94
	3	7	9	238	99	5	50
	2	8	11	Nil		36·5	93
	1	9	14½	Nil		40	17
	3	11	13	166	97	Nil	
	5	17	24	152	97·5	9	15
	3	21	30	84	75	Nil	
	2	24	26	101	94	Nil	
	2	126	39	31	84	Nil	
250	1	9	15	Nil		23	22
	2	11	14	175	98	6	94
	3	17	23	174	91	Nil	
	3	21	29	61	79	4	75
	3	24	27	91	96	Nil	
	2	126	39	26	91	Nil	
300	2	8	11	Nil		33	94
350	1	126	41	35	83	Nil	
400	2	8	11	Nil		29	90

* One puppy had diarrhoea so that all the worms passed may not have been recovered.

TABLE III
PERCENTAGE CLEARANCES OF *A. caninum* FROM DOGS FOLLOWING ADMINISTRATION OF THENIUM P-CHLOROBENZENE SULPHONATE IN THE FORM OF SUGAR-COATED AND UNCOATED COMPRESSED PRODUCTS

Dose level mg. base a.m. and p.m.	Nature of product	Age (weeks)	Weight lb.	Total number worms	Percentage clearance
200	Sugar-coated	19	25	180	96
	Uncoated	19	23	213	93
	Uncoated	19	23	121	94
250	Sugar-coated	19	24	285	95
	Uncoated	19	22	63	73
	Uncoated	19	26	102	93
350	Sugar-coated	20	28	14	100
	Uncoated	20	26	7	100
400	Sugar-coated	20	25	8	100
	Uncoated	20	29	7	100
500	Sugar-coated	20	28	14	100
	Uncoated	20	27	17	76

There was no indication of any toxic reaction in any of the dogs which received thenium p-chlorobenzene sulphonate although some vomition occurred. During the work reported here 17 per cent. of the animals which received 200 and 250 mg. base morning and evening vomited, all of these being 6 to 8 weeks old. In the majority of cases the vomition occurred some time after dosing and did not appear to affect the activity of the drug. The incidence of vomition in unweaned puppies has since been found to be high, and a method of preventing this is now being sought.

Although some vomition does occur it is much less frequent following the administration of this compound than following that of bephenium hydroxynaphthoate. When these two drugs were compared at 50 mg. base per kg. morning and evening to 7-week-old puppies, only 2 of 7 puppies which received thenium vomited, while all 6 given bephenium did so.

Discussion

In order to examine the efficiency of this anthelmintic under as rigorous conditions as possible, an attempt was made to establish concurrent burdens in dogs of over 50 *A. caninum* and over 5 *T. canis*. In some cases the burdens were lower, this probably being due to the resistance of the animal, but in the majority of dogs they were above this level.

There is little published information about the numbers of hookworms which may cause disease in

TABLE IV
MEAN PERCENTAGE CLEARANCES OF *A. caninum* AND *T. canis* FROM DOGS FOLLOWING ADMINISTRATION OF THENIUM p-CHLOROBENZENE SULPHONATE IN THE FOOD

Dose level mg. base a.m. and p.m.	Number of dogs infected with *A. caninum*	*A. caninum* Percentage clearances		Number of dogs infected with *T. canis*	*T. canis* Percentage clearances	
		Range	Mean		Range	Mean
200	5	8—48	34	5	0—24	7
250	2	61—86	74	0		
300	2	69—76	73	2	0—25	13
400	9	0—100	79	13	5—100	57
500	11	55—100	85	14	0—100	49
600	2	47—49	48	2	23—36	30
650	7	40—94	81	2	35—50	43
700	12	55—100	94	1	75	75
750	13	0—100	50	1	40	40
800	4	31—100	69	1	Nil	
850	2	46—73	60	1	80	80
900	2	0—8	4	0		
1,000	1	Nil		0		

dogs but it appears that in chronic cases as few as 5 worms may be present, while in acute cases the number may be over 300 (Nestel, 1960). This very heavy burden was found in a puppy which had become infected *in utero*, and is indicative of the serious problem of hookworm disease in unweaned puppies in tropical and subtropical areas of the world. Unfortunately the incidence of vomition following the administration of thenium p-chlorobenzene sulphonate to such puppies is high but work is in progress to overcome this problem and will be reported later.

The numbers of hookworms in the animals used in the experiments reported here are believed to be as great, possibly greater, than those encountered in weaned puppies and dogs in general practice, so that it can be expected that the use of the drug in the treatment of chronic and acute cases of hookworm disease will result in a practically complete clearance of the causal organism with a concomitant improvement in condition.

TABLE V
PALATABILITY OF FOOD CONTAINING THENIUM p-CHLOROBENZENE SULPHONATE

Dose mg. base mixed in food a.m. and p.m.	Number of dogs	Percentage of dogs which ate		
		All food	Over half but not all	Under half
200	5	60	0	40
250	2	50	50	0
300	2	100	0	0
400	13	69	23	8
500	14	57	21·5	21·5
600	4	50	25	25
650	8	25	50	25
700	12	33	58	9
750	13	23	23	54
800	4	25	25	50
850	2	0	0	100
900	2	0	0	100
1,000	1	0	0	100

TABLE VI
EFFICIENCY OF THENIUM p-CHLOROBENZENE SULPHONATE AGAINST *U. stenocephala* IN DOGS

Dose level mg. base a.m. and p.m.	Method of administration	Number of dogs	Age (weeks)	Mean weight lb.	Mean total number worms	Mean per cent. clearance
200	Gelatine capsule	2	120	38	14	74
200	Uncoated compressed products ...	4	34	33	301	81
250	,, ,, ,,	4	34	34	171	96

There is every prospect that thenium p-chlorobenzene sulphonate will fill the need for a safe and reliable hookworm remedy for dogs and, in conjunction with piperazine, should provide a combined hookworm and roundworm treatment more efficient and less toxic than anything so far available.

Acknowledgments.—We should like to thank all those who gave us help and encouragement in this work especially Mr. S. L. Hignett, Mr. D. Stephenson, Dr. F. C. Copp, Dr. O. D. Standen, Miss W. Ottway and Mr. L. C. Prendergast.

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A Nephelometric Method of Estimating Spermatozoan Density of Gel-free Boar Semen

BY

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SUMMARY.—The spermatozoan density of gel-free boar semen from 22 ejaculates was measured with a haemocytometer.

Standard dilutions ranging from 1 part semen to 4 parts buffered diluent, to 1 part semen to 9 parts buffered diluent were made and their opacity measured in an Evans electroselenium absorptiometer.

A linear correlation between the logarithm of sperm density determined by the haemocytometer and the logarithm of the absorptiometer reading was demonstrated over the whole range of readings used. An even stronger linear correlation was shown to exist when absorptiometer readings fell between 40 and 62.

SEVERAL reports are available of experiments in which the opacity of semen of unknown sperm density was compared visually with suspensions of various chemicals, the opacity of which was the equivalent of that of semen of known sperm density. Burbank (1935), Comstock and Green (1939), Salisbury, Beck, Elliott and Willett (1943), and Kyaw (1944) all used this method, whilst Parsutin and Rumjanseva (1938) compared the opacity of stallion semen of known and unknown density.

On the other hand Comstock and Green (1939), Salisbury *et al.* (1943), Rothschild (1950), Willett and Buckner (1951), and Cox and Melrose (1953) used photo-electric equipment to estimate sperm density of semen, whilst the effect on the accuracy of density determinations of removing seminal plasma and estimating the density of washed spermatozoa was examined by Emik and Sidwell (1947), Rothschild (1950) and Willett and Buckner (1951).

It is essential for the efficient pursuance of studies in semen metabolism, semen collection techniques, and in field artificial insemination experiments where optimum sperm dose necessary to produce pregnancy is to be determined, that a technique is available to facilitate rapid estimation of the sperm density of semen.

There are obvious disadvantages in the use of a haemocytometer where a quick and accurate estimation of the sperm density of semen is needed, and its measurement by determining the opacity of semen of known dilution offers a quick and accurate alternative method.

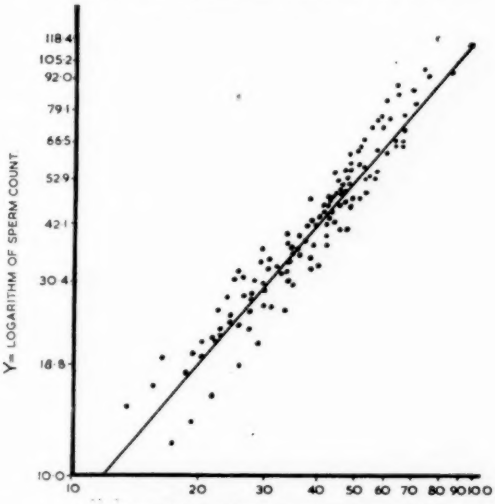
Materials and Methods

Seven unfractionated ejaculates were taken from each of 2 Large White boars and 8 from a third. Collections were made not more frequently than every third day, and often the interval was considerably longer. Immediately after collection the gel fraction of the semen was removed by straining the ejaculate through 4 thicknesses of surgical gauze.

At least 4 haemocytometer counts were made on each ejaculate from semen diluted at the rate of 1:100 with buffered saline of *p*H 7.4; spermatozoa in 80 small squares of a Thoma slide were counted.

For opacity measurements in the Evans Electroselenium absorptiometer the buffered saline diluent was also used. Semen from 20 ejaculates was diluted in a ratio from 1 part of semen to 4 parts of diluent, to 1 part of semen to 9 parts of diluent. The other 2 ejaculates were not diluted over the whole range because insufficient semen was available. Each sample was inverted in the tubular absorption cell. After thorough mixing the semen suspension was allowed to stand for 1 minute before the opacity reading was taken. A blue filter was used in the absorptiometer to measure the opacity of 127 samples of diluted semen of known sperm density.

FIG. 1.—Logarithmic relationship between absorptiometer readings and sperm densities counted on the haemocytometer. Absorptiometer range = 18.5 to 87.



× = Logarithm of absorptiometer reading.
The scale is logarithmic but is graduated in true absorptiometer readings and sperm counts.

Before and during each series of readings the instrument was set at zero with a tube of buffered saline.

Results

With a view to using the absorptiometer reading as a basis for estimating the spermatozoan density of samples, an attempt was made to obtain a simple relation between the variables. The scatter diagram of sperm count plotted against absorptiometer reading gave a curve which was not suitable for the purpose of estimation. Plotting the logarithm of the sperm count against the absorptiometer reading gave, also, a curve of the parabolic type, the form of which, however, suggested that a double logarithmic plot might give a straight line as is shown in Fig. 1.

This view proved true. The coefficient of linear regression, b, was 1.1297 with a standard error αb, of 0.4344. The equation of the line was:—

$$y = 1.1297\ x - 0.1859$$

The ratio of b to αb was 2.60 and P = 0.01. The standard error of estimate ($\alpha est. = \alpha y \sqrt{1-r^2}$) was 0.075.

It was thought advisable to ascertain whether in the range of absorptiometer readings most likely to be obtained in routine work, an even more pronounced linear relation would result. The linear coefficient of regression for the range of absorptiometer readings between 40 and 62 was, therefore, calculated and was found to be 1.3068 with a standard error of 0.0949. The equation of the line was:—

$$y = 1.3068\ x - 0.4836$$

The ratio of b to αb was 14.4 and P = 0.001. The standard error of estimate was 0.043. The scatter of absorptiometer readings in the range of 40 to 62 is shown in Fig. 2.

The regression equations are in logarithms, and for the purpose of estimating sperm density from the absorptiometer reading the regression equation must be expressed in the original variables, *i.e.* in antilogarithms, according to the general formula.

$$X^{-b}Y = 10^{a} \text{ or}$$
$$X^{b}Y^{-1} = 10^{-a}$$

where X and Y stand for the original antilogarithmic values.

Substituting, for the symbols X and Y their meaning in words, it was found that all the data:—

$$\frac{\text{(Absorptiometer Reading)}^{1.1297}}{\text{Sperm Count}} = 1.535$$

from which it followed:—

$$\text{Sperm Count} = \frac{\text{(Absorptiometer Reading)}^{1.1297}}{1.535} \pm 3.6$$

(3.6 is three standard errors of estimate)

For the data from the absorptiometer readings in the range 40 to 62 it was found:—

$$\frac{\text{(Absorptiometer Reading)}^{1.3068}}{\text{Sperm Count}} = 3.05$$

from which it followed:—

$$\text{Sperm Count} = \frac{\text{(Absorptiometer Reading)}^{1.3068}}{3.05} \pm 3.33$$

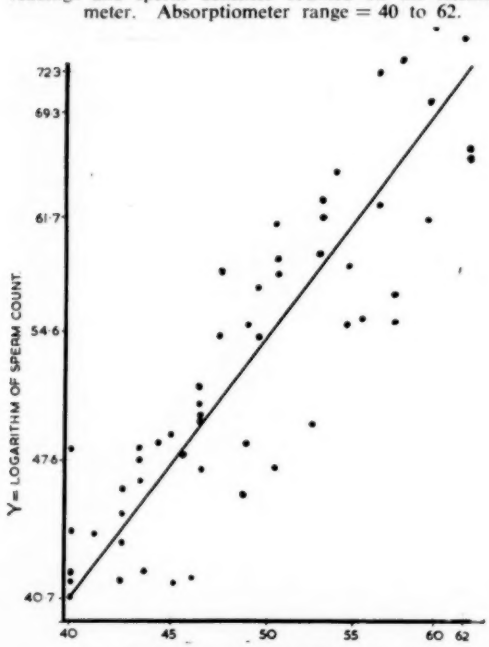
(3.33 is three standard errors of the estimate)

In the range of absorptiometer reading most commonly met with (*viz.* 40 to 62), the linear coefficient of regression was 1.3068 and the standard error 0.0949. Expressed logarithmically the equation of the line in the range of absorptiometer readings 40 to 62 was:—

$$y = 1.3068\ x - 0.4836$$

Thus, from y as the log. absorptiometer reading, the log sperm density x could be calculated.

FIG. 2.—Logarithmic relationship between absorptiometer readings and sperm densities counted on the haemocytometer. Absorptiometer range = 40 to 62.



X = Logarithm of absorptiometer reading.
The scale is logarithmic but is graduated in true absorptiometer readings and sperm counts.

Discussion

Since sterile saline used as the diluent caused precipitation of the protein in some samples, a buffered saline of *p*H 7.4 was used. This latter diluent also prevented agglutination of sperm, a phenomenon which Burbank (1935) considered reduced the accuracy of opacity measurements.

A nephelometric method of estimating the sperm density of whole gel-free boar semen was established. A linear relationship was obtained between the logarithm of the absorptiometer reading and the

logarithm of the sperm count determined haemocytometrically.

The relationship between absorptiometer reading and sperm count determined haemocytometrically was so close as to indicate that it was not necessary to remove seminal plasma by centrifugation.

It was clear from the work of several authors that the relationship between haemocytometer reading and opacity measured by an electric absorptiometer varied according to the species of origin of the sperm. Comstock *et al.* (1939) showed a curvilinear relationship for ram semen suspensions, Salisbury *et al.* (1943) and Rothschild (1950) showed a curvilinear relationship for bull semen which, nevertheless, was converted to a linear relationship when the haemocytometer reading was plotted against the logarithm of absorptiometer reading. Willett and Buckner (1951), however, who worked with bull semen found that a double logarithmic plot was necessary to obtain a linear relationship between absorptiometer reading and sperm count. Cox and Melrose (1953), however, established a linear relationship between the EEL absorptiometer reading and sperm count determined haemocytometrically.

In the present work, where an instrument similar to that used by Cox and Melrose was employed, it was found that the straight line relationship demonstrated by them for bull semen could not be reproduced for boar semen. The relationship in the present work was clearly curvilinear and only a double logarithmic plot enabled a linear relationship to be established.

Although it was shown by Rothschild (1950) and Willett and Buckner (1951) that removal of seminal plasma did not enhance the accuracy of absorptiometer estimation, seminal plasma was found to have some light-interfering properties. It was difficult to see, therefore, why the lines established by Cox and Melrose crossed the axis of the graph precisely at the origin.

The standard error of estimate was considerably reduced in the present work when the range of absorptiometer readings 40 to 62 was used, rather than the whole range of the instrument. For routine use it was necessary, therefore, to assess visually the dilution rate needed to ensure that the absorptiometer reading fell between limits. It was found that with practice this could easily be done.

A table of sperm counts equivalent to absorptiometer readings from 40 to 62 was calculated from the equation of the line so that the density of whole semen could quickly be estimated from the EEL reading and the dilution ratio. Thus, a great saving in time was achieved, for routine sperm counts could be made with the absorptiometer in about 2 minutes, as against 20 to 30 minutes needed to make haemocytometer counts.

Acknowledgments.—The work was made possible by the generous co-operation of Horlicks Farms and Dairies Ltd., Somerset Cattle Breeding Centre. Mr. J. Stower, the veterinary surgeon in charge of the Langford branch gave much practical help. Mrs. B. Newton and Mr. R. Ivens were responsible for

(*Concluded at foot of adjoining column*)

Current Literature

BOOK REVIEWS

Conference on Hypomagnesaemia—British Veterinary Association, November 23rd and 24th, 1960. B.V.A. Publication. Price 5s. to members and 12s. 6d. to non-members.

It is only with difficulty and extreme perseverence that the majority of us to-day can keep abreast even of our own speciality or preference, and lucky are those who can confine their interest to a few subjects. In the veterinary world, so intimately intertwined with agriculture and animal husbandry, the horizon is changing almost daily.

It is all the more welcome, therefore, to be able to study between the pages of one single production the problems which that most fashionable of minerals, magnesium, presents to us in relation to cattle, calves and sheep.

The papers read to the Conference on Hypomagnesaemia in November are indeed comprehensive, and provide material of interest to all members of the profession associated with large-animal practice as well as research. Not only are the clinical aspects dealt with extensively, but also the physiological rôle in the body, the absorption and excretion in the ruminant, and the intake and utilisation of this mineral from the herbage by lactating cows. The occurrence of hypomagnesaemia has exercised the minds of many for a good many years now, and the so-called "stress factors" involved are of extreme interest. Within this group we find not only fluctuating meteorological conditions, but fertiliser treatment of pastures and the overall soil/plant/animal relationship to the disease.

However, what the farmer wants to-day and what the practitioner likes to be able to advise upon is the remedy. There are certainly ways and means of anticipating this malady, but they can the better be put into effect with a thorough understanding of the aetiology of the complex which this publication goes a long way to satisfy.

The proceedings have been produced in a very readable manner, and the papers have been printed in clear type on stout paper.

A Nephelometric Method of Estimating Spermatozoan Density of Gel-free Boar Semen—*Concluded.*

much of the routine work and the recording of the results.

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The Grass Crop—Its Development, Use, and Maintenance. By WILLIAM DAVIES. A. E. & F. N. Spon, London. (2nd edition, 1960). 45s.

What do you, the veterinary surgeon, the research worker in grassland problems, or the veterinary student, want to know about grass ? Do you want an excellent world-wide picture of the place of grassland in agriculture ? Do you want a description of the revolutions caused by the introduction of new grasses, new legumes, fertilisers, and irrigation, and of the problems of grazing management at each plateau of productivity ? Are you interested in why some problems do arise and just as important why some do not ? Do you want a realistic description of the present-day position in Britain side by side with the visions of a prophet ? Can you discuss knowledgeably the establishment of a ley, the choice of grasses, and their persistence ? This book will stimulate the thoughts of any veterinary surgeon—and perhaps the more experienced he is the greater the stimulus since he will be able to fill in the gaps. It describes good grass growing and cultivation practices. It contains the basic essentials of grazing management, the problems of undergrazing and overgrazing, parasitism, deficiency diseases and poisonings, palatability, and dung dispersal.

Indirectly, the effects of drought and rain can be related to British conditions, though the speed of recovery of grass after drought could be better related to grazing management, soil types, and the water table. Species differences are slurred as, for example, in Plate V. where surely the value of the grass/clover pasture depicted should be related to either the sheep or the cow. This type of sward requires more intelligent grazing, cutting, and fertiliser practice, by the cattle grazier than any other. Each system, as is shown again and again throughout this book, taxes the skill of the grass grower and the stockman in its own manner, being reflected comparatively rapidly in the botanical changes in the sward and the problems facing the veterinary surgeon. This range of managerial skill, in the end, not only determines the profitability of the system chosen but also which system should be recommended to the individual farmer. Zero-grazing, not mentioned in the text, will produce its own problems and benefits, some of which can be predicted, others realised only after the event.

Discussion of winter keep is limited to foggage and the early bite with the promise of new grasses, 1 of which is *Phalaris tuberosa* ; though no mention is made of the Australian experience of *P. staggers*. The effect of poaching on the sward the following season is related here to species and stocking rates, but no association is made between foot troubles and rain or inadequate drainage. The decision whether to yard or not is also influenced by new techniques of preserving roughages, such as barn-dried hay, grass silage, and, later in the season, maize and kale silage.

This book should be in every veterinary surgeon's library. The rate of grassland research is ever increasing. For an up-to-date picture one must visit Hurley oneself—after reading this book.

Practical Dog Breeding and Genetics. By ELEANOR FRANKLING. Popular Dogs, London (1961). 21s.

Eight years ago we felt able to give a most favourable notice to the first edition of Eleanor Frankling's " Practical Guide to Dog Breeding." We are happy to be able to give an equally enthusiastic welcome to the second edition which has been fully revised and brought up to date by the author, who has obviously kept herself fully informed of the many developments in the veterinary field as it affects her subject and has incorporated all salient points in the re-written text. An admirable section on genetics has been added and this considerably enhances the value of the work.

In our previous review we suggested that this was a book which could be confidently recommended to clients : experience has more than justified this comment. We know of several practices where it has become routine to request pet-owners breeding from a bitch for the first time to read, or preferably acquire, this book and this advice has saved busy clinicians much time in describing normal whelping procedure, weaning of puppies, etc., in the knowledge that the material offered by Mrs. Frankling would be very much in line with their own advice. Obviously there are minor points with which individuals, lay or professional, will disagree, but the overall excellence of the work is not affected.

Veterinary students who have had little practical experience of dog breeding could read the book with profit. It is one of the very few books written by a layman (even though she is medically qualified we hope the author will not cavil at this description !) for laymen which we can whole-heartedly recommend.

THE NEWMAN TRUST INTERNATIONAL POULTRY AWARD

The Acting Secretary (Mr. T. J. Aley, F.P.A.) of the Newman Trust International Poultry Award announces that the Award Committee in the United Kingdom has decided that the 1961 Award shall be made to Professor F. B. Hutt, Department of Poultry Husbandry, New York State College of Agriculture, Cornell University, Ithaca, New York, U.S.A. There were 4 submissions this year—2 from the United Kingdom, 1 from the United States of America, and 1 from Australia.

The Award was instituted some years ago by the Poultry and Egg Producers Association of Great Britain and has been won hitherto mostly by U.S.A. and United Kingdom workers: last year it was won by a Canadian research worker. This is the eighth time that the Award has been won by a U.S.A. research worker.

The Award was made to Professor Hutt for his outstanding work in the realm of poultry genetics and applied poultry breeding, and consists of a medal and £50 sterling.

The members of the Award Committee in the United Kingdom include: Dr. H. Temperton, J.P., N.D.A., N.D.P. (National Institute of Poultry Husbandry, Shropshire); Alderman E. T. Halnan, M.A. (of Cambridge); and Mr. Michael Pease, M.A. (of Cambridge).

Divisional News

THE LANCASHIRE VETERINARY ASSOCIATION

The summer meeting was held on June 30th, 1961. The programme consisted of a visit to the Research Laboratories of Evans Medical Ltd., at Speke, Liverpool, and commenced at 2.30 p.m. A business meeting and a dinner, at the invitation of Evans Medical Ltd., at the Hanbury Restaurant, Fenwick Street, Liverpool, followed this visit.

During the visit to the Research Laboratories the ladies were taken by coach to Speke Hall; and after tea, they were taken on a coach tour of Liverpool. After this tour, the ladies joined the dinner party at the Hanbury Restaurant.

The business meeting was held at 5.45 p.m., at the Hanbury Restaurant. The President, Mr. R. W. Dye, was in the chair. Nineteen members and 9 visitors were present.

Minutes

The minutes of the meeting held on April 7th, 1961, having been published in THE VETERINARY RECORD, were approved and signed after the addition of the following item which was omitted from the copy submitted for publication. "1. *Minutes:* The minutes of the general meetings of the Association held on March 23rd, May 18th, July 13th and October 6th, 1960, having been published in THE VETERINARY RECORD, were taken as read and signed."

The minutes of the general meeting held on May 31st, 1961, were read, approved, and signed.

Correspondence

Apologies: Apologies for absence were received from 31 members.

A letter was read concerning fees for the vaccination of dogs: the honorary secretary reported that he had received a verbal communication from Mr. J. Gourley, of Ashton-under-Lyne, which stated that eight veterinary surgeons practising in the Stockport area were agreed on the fees for the vaccination of dogs; details of the agreed fees were given. This letter was noted.

A letter was read from Mr. J. Gourley, concerning the admittance of licensees to the Supplementary Register. After some discussion the following resolution was unanimously passed:—

"The Lancashire Veterinary Association requests the Council of the B.V.A. to consider the question of the admission of licensees to the Supplementary Register of the R.C.V.S., and to urge the Council of the R.C.V.S. to take no precipitate action in this matter."

Election of Members

The following were elected to membership: Mr. B. R. Bee, Poulton-le-Fylde; Mr. J. D. E. Wright, Tarporley.

Any Other Business

A member raised the matter of an animal medicine advertisement in a local paper. After the advertisement was read to the meeting it was agreed that a copy of it should be submitted to the B.V.A., with the request that the matter be taken up with the R.C.V.S.

The business meeting was then closed; and a very pleasant evening followed.

The party was entertained to drinks by the President and Mrs. Dye. Twenty-seven members and 20 ladies enjoyed an excellent dinner at the invitation of Evans Medical Ltd. After dinner speeches were minimal but the President spoke for everybody present when he thanked the hosts for the excellent arrangements that were made for the meeting. The programme proved enjoyable and informative. In reply to Mr. Kinnear a director of Evans said that they had welcomed a visit by the Association, and that he was sorry that in the limited time available for the visit to Speke, so much had to be fitted into the space of two hours. He hoped that any veterinary surgeon—who wished to see their work in more detail—would visit the Research Laboratories at a later date.

In conclusion, Mr. E. R. Callender congratulated the President on a pleasant and successful summer meeting.

THE ROYAL COUNTIES VETERINARY ASSOCIATION

An ordinary meeting was held at the new Centre for the Deaf and Hard of Hearing, at Oxford, on Friday, June 2nd, 1961. The President, Mr. E. J. Heather, was in the chair. Twenty-five members were present.

Apologies for Absence

Apologies were read from 12 members.

Minutes

The minutes of the previous ordinary general meeting were read and signed.

Election of Members

The following gentlemen were elected to membership: Mr. P. G. Box, Mr. R. E. Ablett, Mr. L. R. Stirling, Mr. A. W. Roberts, Mr. C. J. Baxter.

Resignations

Resignations were received and accepted from Mr. B. N. Pyke and Dr. F. W. Withers.

Presidential Address

The President, Mr. E. J. Heather, gave an address on the sociological aspects of deafness, and, also, an outline of the history of the Centre which has been established in Oxford. Mr. Gavin Livingstone then gave his paper on the surgical correction of certain aspects of deafness. His paper provoked a useful discussion, particularly from the comparative aspect.

B.V.A. Congress 1961

Members were taken on a tour of the proposed Congress sites.

(Concluded at foot of col. 1 overleaf)

News and Comment

HYPOMAGNESAEMIA CONFERENCE PROCEEDINGS

The proceedings of the Conference on Hypomagnesaemia, organised by the B.V.A. in London in November, 1960, have just been published and copies will be distributed to delegates as soon as possible. A review of this new publication appears on page 761.

Members of the British Veterinary Association may obtain further copies (price 5s. each) on application to 7, Mansfield Street, Portland Place, London, W.1, and they are also available to non-members at 12s. 6d. per copy.

PHOTOGRAPHIC MEETING AND EXHIBITION AT OXFORD

The British Veterinary Association has taken a keen interest in the photographic meeting which is to be held in the Physiology Lecture Theatre, in Oxford, on Tuesday, September 5th, during Congress week. The President of the B.V.A., Mr. S. Jennings, has added his support to the venture by kindly consenting to take the Chair at the meeting.

Much of the time available will be devoted to the demonstration of slides and films of veterinary interest. The material will appeal to a large section of the profession, and a finalised programme will be available from the Congress Office. There will also be a very brief business meeting when it is hoped to consider the possibility of forming an organising committee to deal with future developments in the sphere of veterinary photography.

Space has been allocated in the main marquee at Oxford for an exhibition of photographic prints. This exhibition will be judged by Dr. P. N. Cardew of the Photographic Department of St. Mary's Hospital Medical School, and it is hoped that cash prizes will be available.

The organisers would welcome further material for all sections, and particularly for the exhibition of prints. A guide for exhibitors is now available from the Exhibition Secretary, Mr. K. Barnett, B.SC., M.R.C.V.S., Royal Veterinary College, Camden Town, London, N.W.1, and readers are reminded that all material must be sent in well in advance of the opening of Congress on September 3rd.

Mr. P. R. Greenough, who is in charge of the arrangements, is most anxious that the slides and films to be presented should form a first-class showing, and work in this section which has been produced primarily by a non-veterinarian should not be withheld, provided that the subject matter is of veterinary interest.

CONFERENCE ON THE USE OF RADIOISOTOPES IN ANIMAL BIOLOGY AND THE MEDICAL SCIENCES

The International Atomic Energy Agency (IAEA), the Food and Agriculture Organisation of the United Nations (FAO) and the World Health Organisation (WHO) are jointly organising a Conference on the Use of Radioisotopes in Animal Biology and the Medical Sciences in Mexico City from November 21st to December 1st, 1961.

Its purpose is to bring together from all over the world specialists in the fields of animal biology and the medical sciences who are interested in the use of radioisotopes. It will also serve the purpose of making medical scientists more fully aware of the potentialities of radioisotope techniques in studies on general physiology and biochemistry, and at the same time of acquainting non-medical biologists with problems relating to the physiology of disease and with clinical uses of radioisotopes.

The programme of the Conference covers the following topics:—

(1) Advances in radioisotope technique and method as applied in the biological sciences and medicine.

(2) General physiology, biochemistry and metabolism, including: structure, function and biosynthesis of biologically important compounds; intermediary metabolism, biochemistry as related to genetics.

(3) Mineral metabolism, including: digestion, absorption and transport; biochemical and physiological function of minerals; trace elements.

(4) Skeletal physiology, including: calcium and phosphorus deposition in bone; strontium deposition in bone, remodelling; skeletal physiology and disease.

(5) Physiology of reproduction, including: duration of spermatogenesis and oogenesis; artificial insemination.

(6) Physiology and biochemistry of the ruminant animal, including: digestion and synthesis, rumen

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Divisional News—*Concluded.*

Correspondence

Various letters were read from the B.V.A.

A letter was read from the secretary of the Buckingham National Farmers' Union concerning the Swine Fever Vaccinated Herd Scheme. It was agreed to ask Mr. L. G. Anderson to represent the Division at a meeting to be held in Aylesbury, on Friday, June 9th.

Dinner/Dance

It was agreed that the annual dinner/dance should be held at Henley, on a convenient Friday in the new year.

Election of B.V.A. Council Representatives

The following were elected for the year 1961/62: Mr. E. J. Heather, Mr. D. G. Howell, Mr. N. P. Male, Mr. A. C. Dixon.

Any Other Business

It was agreed that the next meeting would be held at Reading.

microflora; rumen fluids; cobalt, copper and other minerals.

(7) The physiology and biochemistry of lactation, including: synthesis and transport of milk precursors; synthesis in the mammary gland and secretion of milk; the intermediary metabolism of sugar, fat, amino-acids and proteins.

(8) Glandular function, endocrinology, including: the biochemistry of hormone production; transport and metabolism of regulators; correlation of glandular activities.

(9) Poultry: physiology, nutrition and pathology.

(10) Microbiology and immunology.

(11) Haematology including: animal and comparative haematology.

(12) Dentistry.

(13) Clinical research, including: body composition and electrolytes; metabolic studies; absorption studies; circulation studies; localisation studies.

Further information may be obtained from the Joint IAEA/FAO/WHO Secretariat of the Conference on the Use of Radioisotopes in Animal Biology and the Medical Sciences, International Atomic Energy Agency, Kaerntnerring 11, Vienna, Austria.

SWINE FEVER: COMPULSORY SLAUGHTER POLICY

In a Question in the House of Commons on Monday, July 31st, the Hon. Clive Bossom, M.P., asked the Minister of Agriculture, Fisheries and Food whether he was yet able to make a further statement about swine fever. In a written reply the Minister, the Rt. Hon. Christopher Soames, C.B.E., M.P., said:—

"We have had very useful discussions with the interests concerned and preparations are going ahead for the introduction of a compulsory slaughter policy for swine fever early in the new year. The exact date will be announced later.

"All diseased pigs and contacts will be slaughtered and destroyed or buried. Full value will be paid for all pigs slaughtered which show no evidence of swine fever and half value for those which are diseased at the time of slaughter.

"Infected premises will be cleansed, disinfected and kept under restriction for 14 days before restocking is allowed.

"In order to keep the incidence of swine fever as low as possible infected area restrictions will be imposed where necessary, but in the case of isolated outbreaks the immediate premises only will be put under restrictions.

"Vaccination with crystal violet vaccine will be allowed in the earlier stages of the scheme, but policy on this point will have to be recognised in later stages.

"We will watch carefully the progress of this scheme and our hope is that, in a few years, it will lead to the stamping out of swine fever in Great Britain."

EMERITUS PROFESSOR R. M. GORDON

D. L. H. writes:—

Many members of the veterinary profession, and in particular graduates of the Liverpool School, will have been saddened to hear of the death of Professor R. M. Gordon, O.B.E., M.D., SC.D., F.R.C.P., D.P.H., D.T.M., on July 25th.

Nearly all his working life had been spent in the Liverpool School of Tropical Medicine and the laboratories associated with it abroad. He had held professional chairs in the University of Liverpool since 1930; the last of these, that of Entomology and Parasitology, he retired from in 1958. He was a member of the Faculty of Veterinary Science from its creation in 1952 until he retired. During 20 of these years he and his assistants had been responsible for the teaching of parasitology to veterinary students, and many of them will recall the enthusiasm and the modesty with which he approached its veterinary problems. He was essentially a naturalist who was fascinated by the interplay of parasite, host and their environment. Nevertheless he had considerable experimental expertise and many of his contributions to knowledge were based on careful experimentation.

After he retired he continued research into trypanosomiasis with the collaboration of a young veterinary colleague and within weeks of his death he continued to give advice and encouragement. It was characteristic of the man and his devotion that this last work was resulting in findings, which if confirmed, will greatly aid research into the experimental infection of tsetse flies with trypanosomes.

However, this was merely one of his many contributions, for in his time he had given his attention to typhus, immunity to parasitic infections, malaria, schistosomiasis, yellow fever, bovine red water, scabies, insecticides, filariasis, and *Cysticercus bovis*.

These are achievements which will long be associated with his name, but those who knew him personally will also remember with affection a kindly, friendly man whose enthusiasm for his work never flagged until his end.

OVERSEAS APPOINTMENTS

Mr. I. W. Cameron, B.SC. (EDIN.), M.R.C.V.S., has been appointed Veterinary Officer, Tanganyika.

Mr. W. J. A. Payne, Senior Principal Scientific Officer, East African Agricultural and Forestry Research Organisation, Kikuyu, Kenya, has been promoted to Deputy Director.

APPOINTMENT TO THE MILK MARKETING BOARD

The Minister of Agriculture, Fisheries and Food has re-appointed Mrs. Elizabeth McAlpine as a member of the Milk Marketing Board for a period of three years with effect from July 31st, 1961.

UNIVERSITY NEWS

London

Veterinary Pre-clinical Examination: Part II

June, 1961

PASS LIST

Amos, Walter Frederick; Davies, John Huw; Garner, Edward John Albert; Hutchinson, Ian; Jordan, Clive; Lewis, Leon Sidney; MacKendrick, Malcolm Douglas; Okon, Effiong Essien; Onyait, Stephen Ezekiel; Stephens, Dorothy Anne; Stubbs, George Nicholas Lloyd; Tee, Roger David; Townley,

David Brian; Webster, John Michael; Woodyer, Peter John William; Youngman, John Frederick Hewett.

THE REGISTER OF VETERINARY SURGEONS

The undermentioned gentleman, having passed the final examination for the Diploma of the Royal College of Veterinary Surgeons, was admitted to Membership on July 15th, 1961:—

Feeney, James Ignatius, Cashelgarron, Co. Sligo, Eire.

The undermentioned gentlemen were admitted to Membership of the Royal College of Veterinary Surgeons on July 15th, 1961, in virtue of the registrable degree of B.A., M.V.B., conferred on them by the University of Dublin (Trinity College, Dublin):—

Murray, Vincent, Rowlagh, Clondalkin, Co. Dublin, Eire; Thompson, Desmond James, 171, Malone Road, Belfast, Northern Ireland.

The undermentioned gentlemen were admitted to Membership of the Royal College of Veterinary Surgeons on July 15th, 1961, in virtue of the registrable degree of M.V.B., conferred on them by the National University of Ireland:—

Brennan, Dominic Gabriel, "Ave Maria," Menasteraden, Ballaghaderreen, Co. Roscommon, Eire; Buckley, Humphrey Gerard, Clonagh, Model Farm Road, Cork Eire; Collins, John Daniel, 12, Mayor's Walk, Waterford, Eire; Connolly, Joseph Francis, Ahascragh, Co. Galway, Eire; Connolly, Patrick Anthony, Main Street, Charleville, Co. Cork, Eire; Domegan, Christopher Thomas, Clashforde, Maul, Co. Meath, Eire; Flynn, Columba Christopher, St. Michael's Street, Tipperary, Eire; Gowing, Edward Christopher, Killeen, Daingean, Co. Offally, Eire; Hayes, Denis Francis, Rathcoole, Fethard, Co. Tipperary, Eire; Hayes, Michael Laurence, "Glenavon," 42, Howth Road, Dublin, 3; Hernan, Michael Anthony, Keating's Park, Rathcoole, Co. Dublin; Hughes, Andrew Joseph Michael, Graigue, Cuffsgrange, Co. Kilkenny, Eire; Kavanagh, Sean Patrick, Baher, Streamstown, Co. Westmeath, Eire; Kenny, Francis William, 156, Upper Drumcondra Road, Dublin; McDonald, Laurence William, Ardreston Lodge, Rathoe, Co. Carlow, Eire; McHugh, James Finbarr Stanislaus, Mountain View House, Green Road, Carlow, Eire; Nolan, John Pascal Joseph, Cahir, Co. Tipperary, Eire; O'Reilly, Gerald Thomas, 13, The Crescent, Castleblaney, Co. Monaghan, Eire; Power, John Columba, Brown Street, Pontlaw, Co. Waterford, Eire; Roche, Richard John, Main Street, Moate, Co. Westmeath, Eire; Toal, James Joseph, Ranelly, Omagh, Co. Tyrone, N. Ireland; Vaughan, John Joseph, 3, Castle Street, Enniscorthy, Co. Wexford, Eire.

The undermentioned were admitted to Membership of the Royal College of Veterinary Surgeons on July 19th, 1961, in virtue of the Registrable degree of B.V.M.S., conferred on them by the University of Edinburgh:—

Anderson, Euan Caie, Box 25, Naivasha, Kenya; Arbuckle, James Brian Robertson, Wildacre, Ashley Drive, Ashley Heath, Ringwood, Hants.; Bailey, Sheila Ann (Miss), "Garfield," Gamekeepers Road, Barnton, Edinburgh, 4; Bell, Alastair Findlay, 1, East Castle Road, Edinburgh, 10; Broome, Brenda Mary (Miss), 8, Elmfield Avenue, Birstall, Leicestershire; Carwardine, Paul Charles, 45, Silkmore Crescent, Stafford; Cooper, Michael Jack, 105, Caversham Avenue, Palmers Green, London, N.13; Coulthwaite, John Richard, School House, Barbon, *via* Carnforth, Lancs.; Davies, Charles Stuart, 22, Balmoral Avenue, Thornaby-on-Tees, Yorks.; Duncan, Walter Donald, Easter Kintrae, Elgin, Moray; Foggie, Janet (Miss), 10, Dean Park Crescent, Edinburgh, 4; Forbes, Derek, "Dunbreck," Blackhouse Lane, Ryton-on-Tyne; Fraser, Thomas Walter, Ochil View, Hill of Kinnaird, By Falkirk; Haigh, Arthur James Barry, "Four Winds," Doncaster Road, Thrybergh, Nr. Rotherham, Yorks; Hargreaves, Charles Eric, "Beechcroft," Clitheroe, Lancs.; Hoskin, Brian Derek, "Greyholme," 16, Kingwell Road, Worsborough Bridge, Barnsley, Yorks; Jobling, Terence Maxfield, "Ghaystrills," 15, Brougham Street, Skipton, Yorks.; Jones, Robert Anthony, 68, Pine Grove, Cimla, Neath, Glamorgan, S. Wales; Kirk, James Oliver, 61, Hunter Terrace, Sunderland, Co. Durham; Kirkham, John, "Kenton," 78, Downing Avenue, Basford, Newcastle-under-Lyme, Staffs.; MacIntyre, Gerald Charles, Tullock Farm, Dingwall, Ross-shire; McNab, Ian, Forest Lodge, Horton Road, Ringwood, Hants.; Marsh, Ian Andrew, 25, Murrayshall Road, Scone, Perth; Meldrum, Keith, Cameron, The Manor, Ibstock, Leicestershire; Mighell, John Stanley, Maroussi, Weydown Road, Haslemere, Surrey; Muirhead, Michael Rowland, Stone House, Wath Wood Road, Wath-on-Dearne, Nr. Rotherham, Yorks.; Paterson, Robin Johnson, "Murrayfield," Coulter Road, Biggar, Lanarkshire; Pearson, Michael Valentine Milton, "Wavercroft," Waverton, Wigton, Cumberland; Reece, Peter, Black Lion, Rhes-y-Cae, Nr. Holywell, Flintshire, N. Wales; Reeves, Ronald Jonathan Charles, 362, Worting Road, Basingstoke, Hants.; Rodger, John Owen Kelvin, Box 728, Bulawayo, S. Rhodesia; Sansi, Kamoru Adekunle Ola-Olorun, Esure, Ijebu-Imusin, Nigeria; Schermbrucker, Christopher Geard, Box 158, Kiambu, Kenya; Stewart, Colin George, P.O. Box 8209, Causeway, Salisbury, S. Rhodesia; Sutherland, Stewart Dearg, 27, Jackson Street, Penicuik, Midlothian; Wilson, Michael, Hall Farm, Nunthorpe, Middlesbrough, Yorks.; Wood, Hamish, 19, Woodstock Road, Croydon, Surrey; Young, Godfrey Fischer, Holmeland Farm, Stoneygate, Houghton-le-Spring, Co. Durham.

The undermentioned gentleman was admitted to Membership of the Royal College of Veterinary Surgeons on July 19th, 1961, and was registered in the Commonwealth List in virtue of the degree of D.V.M. (Ontario):—

Sack, Otto Wolfgang, Dept. of Anatomy, Ontario Veterinary College, Guelph, Ontario, Canada.

R.C.V.S. OBITUARY

We record with regret the deaths of the following members of the profession:—

DOLAN, Peter Francis, of 4, Hollywood Drive, Goatstown, Co. Dublin. Graduated Dublin, July 24th, 1911. Died aged 72 years. Mr. Dolan was a member of the Council of the Royal College of Veterinary Surgeons from 1932 to 1951.

Supplementary Veterinary Register

PICKWORTH, William Henry, 34, Cheriton Court Road, Folkestone, Kent. Registered December 23rd, 1949, as number 241 on the Supplementary Veterinary Register. Retired. Died, aged 67, July 23rd, 1961.

PERSONAL

Births

BLACKBURN.—On Friday, June 30th, 1961, to Mary, wife of Trevor Blackburn, B.VET.MED., M.R.C.V.S., of Monduli, Masailand, Tanganyika, a son, John Andrew.

BOLTON.—On July 29th, 1961, to Elizabeth, wife of Frederick Noel Bolton, B.V.M.S., M.R.C.V.S., at Newton Aycliffe, a son, Rodger Frederick, brother for Stephen.

CLAYDON.—On July 27th, 1961, at "Melrose," Okehampton, to Gillian, wife of Roy Clavdon, M.R.C.V.S., a daughter, Phillippa Judith, sister for Deborah, Stephanie and Lindsay.

DONCASTER.—On June 16th, 1961, to Ursula, wife of R. A. Doncaster, Waltham, a son, Jeremy, brother for Christopher and Nicholas.

FORSYTH.—On July 28th, 1961, to Stella, wife of Harry Forsyth, M.R.C.V.S., twins, a son and daughter.

COMING EVENTS

September

2nd (Sat.). STREATLEY '58 CLUB REUNION. Annual Dinner at "Ye Miller of Mansfield."

3rd to 9th (Sun. to Sat.). 79th Annual Congress and Exhibitions of the British Veterinary Association at Oxford.

7th (Thurs.). ROYAL VETERINARY COLLEGE ASSOCIATION. Annual Dinner during the B.V.A. Congress at St. Edmund's Hall, Oxford.

GLASGOW VETERINARY SCHOOL ALUMNUS ASSOCIATION. Dinner at the Mitre Hotel, Oxford, 7 p.m.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the date on which disease has been confirmed, followed by the postal address and local authority.

Anthrax

July 26th, 1961. T. J. Reed, Yard Farm, Upottery, Honiton, Devon (Parish: Upottery). (Cattle.) DEVON.

July 31st, 1961. Mrs. M. A. Smith, Bridge House Farm, Laneshawbridge, Colne, Lancs. (Parish: Colne). (Cattle.) LANCASHIRE.

Fowl Pest

July 25th, 1961. L. J. V. Jasper, Hall Farm (Barham) Ltd., Barham, Ipswich, Suffolk. EAST SUFFOLK.

July 25th, 1961. T. B. Liversey, New Wicken House Farm, Withnell, Chorley, Lancs. LANCASHIRE.

July 25th, 1961. W. Cockerill, 7, Worsley Street, Rising Bridge, Accrington, Lancs. Disease at: Rising Bridge Holding, Accrington, Lancs. LANCASHIRE.

July 25th, 1961. W. Cockerill, 15, Oak Avenue, Rising Bridge, Accrington, Lancs. Disease at: Top of the Bank Holding, Rising Bridge, Accrington, Lancs. LANCASHIRE.

July 25th, 1961. H. Yarrow, No. 2, Council Houses, Ely Road, Little Thetford, Ely, Cambs. ISLE OF ELY.

July 26th, 1961. J. Holden, Brimmicroft Farm, Houghton, Preston, Lancs. LANCASHIRE.

July 26th, 1961. E. P. Myerscough, Bent Farm, Withnell, Chorley, Lancs. LANCASHIRE.

July 26th, 1961. C. H. Mason, Crossfield Farm, Withnell, Chorley, Lancs. LANCASHIRE.

July 27th, 1961. J. Hessell, No. 5, The Cottages, Grange Farm, Great Limber, Grimsby, Lincs. LINCOLN, PARTS OF LINDSEY.

July 28th, 1961. J. Marginson, Quarry Bank Farm, Houghton, Preston, Lancs. LANCASHIRE.

July 28th, 1961. W. J. Snook, Green Valley Farm, Ubbeston, Halesworth, Suffolk. EAST SUFFOLK.

July 28th, 1961. Mrs. M. E. Money, 13, Council Houses, Little Thetford, Ely, Cambs. ISLE OF ELY.

July 29th, 1961. E. Gillett, 5, Council Houses, Little Thetford, Ely, Cambs. ISLE OF ELY.

July 30th, 1961. Miss E. Sansome, The Hazels, Wicken Road, Clavering, Saffron Walden, Essex. ESSEX.

July 30th, 1961. P. Cammidge, 333, Benfleet Road, South Benfleet, Essex. ESSEX.

July 31st, 1961. M. W. Rumsey, The Avenue, Eye, Suffolk. EAST SUFFOLK.

July 31st, 1961. F. J. Bassingham, Vineyard, Little Thetford, Ely, Cambs. ISLE OF ELY.

July 31st, 1961. B. Goodwin Ltd., Merton Farm, Little Bury, Saffron Walden, Essex. ESSEX.

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

SCIENTIFIC

The Effect of a New Analgesic Induction Agent on Goats

Sir,—A problem which I have had to solve recently has been to render adult goats immobile and quiet for periods of 2 hours or more. Anaesthesia by volatile agents requires continued attention throughout the period and was to be avoided if possible. Barbiturates by themselves are too short-acting, produce copious salivation, are solely hypnotic possessing little if any analgesic effect, and repress respiratory and cardiovascular systems considerably.

A new analgesic agent called Sernyl has been used with satisfactory results. This drug is undoubtedly the most potent general analgesic agent which has yet been used in human clinical medicine. It has the unique advantage of causing no depression of either the cardiovascular or respiratory functions and can be safely used. In monkeys doses of 0.3 to 0.6 mg. per kg. intravenously induced a cataleptoid state lasting up to 1 hour during which time maior surgery could be performed without difficulty whilst the animals appeared to be awake and alert. The oral administration to cats and dogs produced similar results (Johnstone, Evans & Baigel, 1959).

Sernyl is a white solid, freely soluble in water and ethanol. Its chemical name is 1-(1-phenyl cyclohexyl) *piperidine* monohydrochloride. Parke, Davis & Co. kindly supplied it in solution, 100 mg. per ml.

I used it on adult goats by intramuscular injection in doses ranging between 0.5 mg. and 16 mg. per kg. bodyweight. The accompanying table summarises the major clinical effects.

In general, animals went down within 1 to 10 minutes of injection depending on the dose. At the lowest dose goats remained standing though quite immobile and in 5 to 20 minutes quietly subsided on to their sides. During this induction there was no period of excitation. Absence of reaction to painful stimuli was noticed at all dose rates. Muscular tonicity especially of the neck and limbs occurred. Vertical nystagmus, except at the highest dose rate, was a noticeable feature. A characteristic was that pharyngeal and laryngeal reflexes appeared not to be depressed: the risk of respiratory obstruction seemed small and intratracheal intubation was not necessary. When the animals recovered and regained their feet they began eating at once.

Another valuable feature is that a preliminary dose of Sernyl reduces the quantity of barbiturate necessary to produce surgical anaesthesia.

My general impression was that Sernyl is a new safe analgesic induction agent which may be of value in many veterinary medical procedures encountered in general practice.

The manufacturers emphasise that Sernyl is still undergoing clinical trials, and cannot yet be recommended for a number of species. It is contra-indi-

TABLE I
EFFECT OF SERNYL ON THE GOAT

Mg. per kg. intramuscularly	0·5	0·75	1	1·5	2	4	6	10·4	16
Locomotion...	Moored to floor after slight ataxia	Ataxia	Ataxia, moored to spot	Nil	Nil	Nil	Nil	Nil	Nil
Muscular tonus	Subcutaneous fibrillation. Normal	Slightly hypertonic legs and neck	Slightly hypertonic neck and limbs	Hypertonic legs and neck	Hypertonic legs and neck	Hypertonic legs and neck	Hypertonic legs and neck	Hypertonic	Hypertonic
Time to go down from injection	8 to 50 mins.	20 mins.	5 to 15 mins.	5 to 10 mins.	3½ to 8 mins.	5 mins.	2 mins.	1½ mins.	1 min.
Jaw movements	Slight	Slight	Yes +	Yes +	Yes ++	Yes ++	Yes +++	Yes +++	Yes +++
Eyelids ...	Open	Open	Open	Open	Open	Open	Open	Open	Open
Pupil ...	Slightly dilated	Slightly dilated	Dilated +	Dilated +	Dilated ++	Dilated +++	Dilated +++	Dilated +++	Dilated +++
Corneal reflex	+	+	+	+	+	+	Slightly depressed	Suppressed	Suppressed
Visual response	+	+	?	?	?	?	No	No	No
Respiration...	Normal	Normal	Slightly increased	Increased	Increased	Increased	Increased	Increased	Increased
Pulse ...	Normal	Normal	Slightly increased	Slightly increased	Slightly increased	Increased	Increased	Increased	Increased
Temperature	Normal	Normal	Normal	Slightly increased	Slightly increased	Slightly increased	Slightly increased	Slightly increased	Normal
Involuntary voiding of faeces and urine	Yes	No	Yes	No	No	No	No	No	No
Analgesia ...	Very slight	Slight	Slight	Slight	More ?	+	++	+++	++++
Anaesthesia...	—	—	—	—	—	—	—	Slight	Slight
Duration till on feet	1 to 1½ hrs.	2 hrs.	2 to 3 hrs.	3 hrs. +	3½ to 4 hrs.	6 to 8 hrs.	8 to 12 hrs.	10 to 14 hrs.	12 to 18 hrs.
Salivation ...	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight

cated in small rodents which become excited, in dogs which may convulse at anaesthetic doses, and in horses which show anxiety and restlessness.

Yours faithfully,
J. H. WILKINS.

Medical Research Council,
Radiobiological Research Unit,
Harwell,
Didcot,
Berks.
July 7th, 1961.

Reference

JOHNSTONE, M., EVANS, V., & BAIGEL, S. (1959). *Brit. J. Anaes.* **31**. 433.

Antigenic Relationship of Some Bovine Viral Diarrhoea-mucosal Disease Viruses from the United States, Great Britain, and West Germany

Sir,—Several viruses which appear to be members of the viral diarrhoea-mucosal disease complex have been isolated in various parts of the world; however, the interrelationship of most of these agents has not been determined. As a preliminary step in this direction, we have initiated serum neutralisation studies to investigate the antigenic relationship of several members of this group.

Neutralisation tests were conducted against a bovine viral diarrhoea virus (Oregon C24V) originally isolated by Gillespie *et al.* (1960), from a field case of the disease in Oregon, U.S.A. The antisera used in our tests came from calves exposed experimentally to various viral diarrhoea-mucosal disease agents isolated in New York by Baker *et al.* (1954); in Iowa by Ramsey (1956); in North Dakota by Schipper and Noice (1959); in Indiana by Pritchard (1955); in England by Huck (1957); in West Germany by Stöber (1959); and in Scotland by Dow *et al.* (1956).

Oregon C24V virus was propagated in bovine embryonal kidney tissue culture. It had a titre of 1×10^6 plaque forming units per millilitre. Sera, previously heated for 30 minutes at 56° C., were diluted 1:10, 1:100, and 1:1,000; mixed with virus to give approximately 350 plaque forming units of virus per millilitre; and incubated at 25° C. for 1 hour. The per cent. of virus neutralised was quantitated by a plaque assay system using bovine testicular cell cultures as described by Kniazeff and Pritchard (1960).

All of the post-inoculation sera neutralised in high dilution the test virus (Table I). All tests were conducted on paired pre- and post-inoculation sera excepting those from Scotland, for which pre-inoculation samples were not available. The pre-inoculation sera were negative for all of the animals included in the table. However, among the sera from North Dakota, Iowa, and England there were specimens with low pre-inoculation virus neutralising titres, precluding the conclusion that the convalescent serum titre definitely resulted from infection with

TABLE I
NEUTRALISATION OF VIRAL DIARRHOEA VIRUS (OREGON C24V) WITH VIRAL DIARRHOEA-MUCOSAL DISEASE ANTISERA*

Serum type†	Isolate	Number of Samples	Serum dilutions: Pre-Inoculation	Post-inoculation		
			1 : 10	1 : 10	1 : 100	1 : 1,000
Oregon ...	C24V	10	0	100	100	92
New York	NY-1	14	0	100	97	62
Iowa ...	Sanders	6	0	100	100	85
North Dakota	BMD	4	0	100	100	75
Indiana ...	MD-1	5	0	100	100	100
England...	LS	2	0	100	100	94
West Germany	Lam-springe-60	2	0	100	100	100
Scotland..	GPB	2	None	100	100	100

* Expressed in per cent. of average plaque forming units neutralised.
† Locations cited indicate origin of viral isolates corresponding to antisera tested.

the experimental agent under study. The results of these titrations are not included in the table.

The neutralisation results with North Dakota antisera corresponded qualitatively with the results of neutralisation tests obtained with homologous virus. The neutralisation results on several sera from England corresponded qualitatively with those obtained by gel diffusion precipitin tests with these samples against the homologous virus.

These results indicate that an antigenic relationship exists between bovine viral diarrhoea virus (Oregon C24V) and viral diarrhoea-mucosal disease viruses from various parts of the world. The extent of this relationship, however, is not revealed by this study. Furthermore these findings do not imply that all of the agents involved as causative factors in the viral diarrhoea-mucosal disease complex are identical or are related.

Yours faithfully,

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July 25th, 1961.

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GENERAL

The Future of the Profession

Sir,—Recent articles and correspondence in THE VETERINARY RECORD, and recent developments within the profession make it clear that there is general concern about the position of practising veterinary surgeons in British agriculture.

The national and farming press show that the post-war boom is over, and with the possibility of Britain joining the common market there will be a complete reassessment of our agricultural policy. *Punch* rudely implies that European agriculture is being forced into the twentieth century! Professor Hendrie (1961) shows that, at present, State subsidies account for about 70 per cent. of the profits made by British farmers, and the Economics Committee Report of the Society of Practising Veterinary Surgeons shows that State-paid LVI work in general agricultural practice provides not only a large proportion of practice profits, but also makes possible the employment of additional assistants within practices that would otherwise be too small to be run comfortably with a rota for free time and holidays.

However, the regular visits made by practitioners to their clients when tuberculin testing are becoming less frequent. These State-paid visits have given veterinary surgeons an opportunity to put over the scope of the service the profession can give, and have enabled occasional advice on preventive medicine and animal husbandry to be given. As recent articles have pointed out, the lengthening periods between these visits will increase the significance of the void that lies between the NAAS and the Animal Health Division of the Ministry of Agriculture in these fields and to the lack of contact between the farmer and his veterinary surgeon in them. At present preventive medicine has been largely taken over by commercial drug firms and there is a flourishing and highly competitive retail trade in preventive medicines and worm remedies. The vast advertising campaigns and numerous information pamphlets put out in support of these products, coupled in some cases with fieldsman technical services to farmers—all paid out of profits—have led increasingly to the by-passing of the practising veterinary surgeon, and when he *is* employed by his clients to use some

"restricted" drug it is almost as if he were working by courtesy of the drug firm concerned, the success of whose advertising campaign has led the farmer to send for him to carry out a specified treatment. As each firm, however good, must look after its own interests by sales, this has led to the ideal of preventive medicine becoming subservient to purely commercial interests.

Veterinary surgeons in agricultural practice to-day are therefore dependent on the State through their LVI appointments for a high proportion of their income and for the adequate staffing of their practices; they are dependent on the success of the advertising campaigns of various drug companies for a further proportion, and on the farmer, 70 per cent. of whose income is provided by the State, for the remainder. Where does the "rugged independence" of private practice fit into this picture?

As agricultural profit margins continue to narrow, as farmers' co-operatives for the sale of drugs, pharmaceuticals and hypodermic syringes become more widely used, as farmers carry out more and more routine medical and surgical procedures for themselves, and as the commercial coverage of the field of preventive and routine medicine becomes more complete, the sphere of influence of the practising veterinary surgeon in his present form will decrease; profitability of agricultural practice will wane, clinicians will be increasingly forced into the field of pure trading to boost their profits, and there will inevitably be an increase in the wrong sort of rivalry between neighbouring practices as each tries to keep its head above water.

The council of the Royal College of Veterinary Surgeons meanwhile continues to make it clear that the profession should remain vocational. It acknowledges the "do-it-yourself" trend of the farmer, providing no gross cruelty results, and by discouraging practitioners from acting as retailers and forbidding any sort of professional advertising, tends to keep the farmer away from his veterinary surgeon and go elsewhere for the technical advice that goes with the dispensing of "home treatments" and preventives.

No lead is being given in the practical field of financial returns to the profession. At present agricultural practice is an ill-balanced mixture of vocational work, State work, and retail sales, all of which are necessary if veterinary surgeons are to be able to earn an income commensurate with their skill and training. There is, however, a regrettable tendency for the practitioner-client relationship to degenerate into that of tradesman and customer. If this is to be halted the part the profession should take in the commercial field must be clarified. We must either stand as a profession or as a skilled trade; at present we fall confusingly between the two. If those in agricultural practice would realise that they *are* an integral part of the agricultural industry and that their standard of living *now* depends either directly or indirectly on the State, the bogey of nationalisation could be laid, less sentiment and hooey would be talked about sturdy independence, and the profession could unite to develop the neglected fields of preventive and advisory medicine upon which the future position should partly depend. These fields, so important to the success of a competitive agriculture, could be opened up on an unbiased scientific footing by extensions to the NAAS and the Animal Health division of the Ministry of Agriculture, and pure commercialism could be separated from them.

Action must be taken if any dignity is to be retained by the profession. If nothing positive is done private practice must become frankly commercial and the R.C.V.S. must modify the code of professional conduct accordingly so that practitioners can compete on equal grounds with commercial firms in the advisory field. It would in any case be a retrogressive step for the profession to lose touch with the farmer in this field and, furthermore, curative medicine and surgery alone cannot support the number of veterinary surgeons at present employed in agricultural practice, however the scale of professional fees is increased.

Yours faithfully,

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Herts.

July 24th, 1961.

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Caesarean Section in a Thoroughbred Mare

Sir,—The following case involving caesarean section in a Thoroughbred mare may be of interest to readers.

The subject was a 9-year-old Thoroughbred mare carrying her second foal. The mare had commenced foaling early one morning and was found cast against some iron railings out in an orchard; she had all four legs through the railings. Extracted from this predicament without more than superficial abrasions, the mare regained her feet.

Examination revealed an anterior presentation with a nape presentation of the head. There was still feeble movement of the foal. To overcome straining an epidural injection of 18 c.c. of a 2 per cent. procaine hydrochloride* local anaesthetic solution was given, but it was still found impossible to reduce the nape presentation. In the hope of delivering a live foal an immediate caesarean section was decided upon.

The mare was cast with little difficulty, the epidural injection producing inco-ordination of the hind legs and the mare was secured in right lateral recumbency. Anaesthesia was induced with intravenous chloral hydrate in 10 per cent. solution to a stage of light surgical anaesthesia. After preparation, the left flank area was infiltrated with 2 per cent. procaine hydrochloride local anaesthetic* solution.

A vertical incision was made in the middle of the left flank extending downward some 18 inches. The uterus was located and could easily be raised to the wound surface by grasping the foal's hind leg through the uterine wall. After incising the uterus

the foal was delivered by its hind legs with the help of two assistants. It was unfortunately dead. The afterbirth was left intact and after insertion of two chlortetracycline soluble tablets† the uterine incision was closed with a continuous Lembert suture of double-strand No. 3 chromic gut. The abdominal wound was closed in two layers; the composite layer of peritoneum, adipose tissue and transverse aponeurosis being sutured with interrupted sutures of double-strand No. 3 chromic gut. Skin, internal and external oblique muscle layers and including the already sutured layer, with vertical mattress sutures of four-stranded No. 2 monofilament nylon. The muscle layers were liberally coated with penicillin and streptomycin cerates. Muscular relaxation was good throughout and the only haemorrhage requiring ligation being one or two arteries from the internal oblique muscle.

The mare was encouraged to get up three hours after the completion of the operation and though still slightly inco-ordinated on her hind legs, walked quietly to a well bedded loose-box.

The afterbirth was removed 8 hours later *per vaginam*. Three days post-operatively extensive oedema developed extending over the whole ventral abdomen and forward to the sternum, it had dispersed by the 10th day. The mattress sutures were removed on the 12th day and although there was some superficial suppuration, this soon cleared up after removal of the sutures. Tetanus antitoxin was given and parenteral administration of procaine penicillin and dihydro-streptomycin sulphate was maintained for 3 days post-operatively.

The mare's temperature remained normal and her appetite was excellent throughout. Subsequent progress has been uneventful and she has since put on a lot of condition at grass.

Yours faithfully,
PETER M. STOKES.

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July 27th, 1961.

* Ravocaine (Bayer).
† Aureomycin Soluble Oblets (Cynamid).

Blood Transfusion in Veterinary Practice

Sir,—With reference to the article "Blood Transfusion in Veterinary Practice," which was published in THE VETERINARY RECORD of July 8th, I should like to record the following points.

An initial transfusion of unmatched whole blood in cattle is not always free from danger. Braend in 1959 said that he considered the chances of an initial transfusion causing a reaction due to anti-J were about 1:16 in summer and almost negligible in winter. This difference is related to the seasonal variation in the titre of anti-J. Neimann-Sorensen in 1958 recorded that a cow in one of his immunisation series showed a reaction to an initial transfusion. Also, Ferguson in 1961 reported that he had a cow with a rather high level of anti-J. At the first transfusion, it experienced a moderate shock reaction and aborted a few days later.

Work that has been done here recently and by Neimann-Sorensen in 1958 indicates that the standard haemolytic test is not satisfactory for determining whether or not a cow will show an incompatibility reaction. It has been suggested that very small amounts of antibody will provoke anaphylactic shock and that antibodies in such quantities are not detectable by the usual haemolytic test. Unfortunately, work by Haring in 1960 showed that this test is the most satisfactory one available. Owing to the large number of blood groupings that may be encountered in cattle, it would be difficult in practice to find a compatible donor even if there was a reliable test available.

It appears that one should follow the advice of Braend in which he suggests the use of a "trial injection." The recipient is given up to 200 ml. of blood and the transfusion is then stopped for 10 minutes. If no signs of shock appear it may then be continued.

Yours faithfully,
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July 24th, 1961.

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Some Observations on Bovine Farcy

Sir,—I have read the letter in THE VETERINARY RECORD of May 20th, 1961, from Dr. F. I. Awad in which he comments on my article on bovine farcy published in THE RECORD of April 15th, 1961.

Awad starts his letter by listing the various reasons on which he based his findings in 1958 to show that bovine farcy is a fairly common disease, particularly in the west and south Sudan. It strikes me as an absurd argument that Awad should have based his findings in 1958 on reports issued 2 years later by Uilenberg (1960), Karrar (1960), Meat Inspector Report (1960-61), Annual Report of the Assistant Director Research (1960) and the Senior Meat Inspector's tour in 1960.

It is true that no attempts were made—nor could it have been possible to make any—to detect the exclusively internal type of the disease. But it also appears a remote possibility that such a type would be fairly common in herds where no animals were seen with external lesions. Awad's contention "that the abattoir figures supported the view that it might be the commoner one" is based on an assumption that the slaughtered animals did not show external lesions as well—a possibility that cannot be so easily dismissed, particularly when we know that

animals with the external type are not rejected at the *ante-mortem* examination, and that Awad neither carried out the *ante-mortem* examination nor the examination of carcases at the abattoir.

Further, if one accepts Awad's assumption (with which I disagree) that the disease is fairly common in the southern Sudan and that the internal type was probably the more common, one would have at least expected a few internal cases out of the 2,000 animals slaughtered at Kosti Meat Factory during November, 1955. Goetzsche did not record any condemnations due to bovine farcy.

As far as the fragmentation of the mycelia is concerned I am still of the opinion that one can always find branching filaments when examining smears from positive lesions.

The question of nocardiosis of the bovine udder and testis again illustrates one of Awad's generalisations when, after examining only 14 cases, he drew the conclusion (1960) that "Nocardiosis of the udder and testis appeared to constitute an important part of this problem."

Yours faithfully,
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July 18th, 1961.

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Veterinary Services in Africa

Sir,—A considerable amount of work dealing with the veterinary services in Africa has already been carried and written about by people with both experience and distinction that what follows can only be regarded as additional, supplementary, and general in character.

The veterinary profession's responsibilities anywhere in the world must include the alleviation of disease from animals and the promotion of their production and general welfare. Veterinary services in Africa to-day can only be adequately discussed in the general context of agricultural and human health problems.

In a large part of Africa to-day a vicious cycle of poverty, disease and malnutrition (particularly deficiencies in animal protein) must be broken somewhere before the peoples affected can attain the "take off" stage to higher endeavours. Among the more recent studies on tropical malnutrition in Africa are included those by Professor D. B. Jelliffe and Dr. R. F. A. Dean (1959) and that of Dr. J. McFie (1958). The problems discussed so competently present both a challenge and an opportunity not only to veterinarians but to all the professions concerned with the welfare of society.

In a large part of Africa to-day, Vogts' formula: C = B : E, where C = carrying capacity, B = Biotic Potential, E = Environmental Resistance, the latter weighs heavily against the attainment of the maximum carrying capacity of the land.

Two examples can suffice to illustrate the equation. It is estimated that an effective control of trypanosomiasis would effectively double cattle productivity in the tsetse belt of Africa (1961).

Agricultural development and the realisation of the latent potentiality of the available natural resources everywhere rest essentially upon the modification of the existing ecological equilibrium so that new conditions are produced in which factors inimical to man are either neutralised or eradicated. The several species of tsetse fly and the various disease-bearing trypanosomes which these are capable of carrying are major factors in the existing ecological and biological equilibrium in East Africa (1953-5).

So far, the only permanently effective method of controlling the disease is by a physical separation of the vector from the animals. This can be done by the establishment of farming methods and techniques that will render the vector's natural habitat inhospitable. In the initial stages of the campaign, a modification of zero grazing can be a possible line of attack. It is appreciated that the problems involved cannot be underestimated and include capital investment for machinery, water supply, and land tenure problems. These factors emphasise the need for an intimate liaison between the various departments concerned in land usage.

The other example, peculiar to East Africa, is the tick-borne disease of East Coast fever which is responsible for high mortality in calves—about 60 per cent. in certain areas (1958). It is considered that a comprehensive programme of dipping animals can effectively control the disease and recommendations to that end were made some 8 years ago (1953).

Animals can only express their highest genetic potential when provided with the best possible environment—the latter used in its widest sense to include both freedom from disease, high nutrition and management.

Clearly, against the above background, the veterinary services must concentrate on eradicating the major diseases that limit animal production. To this end it seems that it is not lack of veterinary knowledge that is holding back progress but a degree of inertia to apply effective means of alleviating the present problems and get on with the more modern applications of the science.

Yours faithfully,
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July 16th, 1961.

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